National Institute of Environmental Health Sciences

Investigating the independent and synergistic effects of heat waves and air pollution on health: The EuroHEAT Project

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Abstract:

Objective: The increased mortality associated with heat-wave episodes has been well documented in many studies. An interesting aspect is the role of air pollution in this relationship. Within the EuroHEAT project, the potential confounding by air pollution variables and interaction between heat waves and air pollution was investigated using data from nine European cities for the period 1990–2004. Material and Methods: For the analysis we used a GEE modeling approach. City specific analysis by cause of death and age group was performed for the summer months (June–August). Estimates were combined in a second stage analysis. Results: Heat wave effects on total natural mortality are not confounded by NO2, SO2, and CO levels. However, if the models are not adjusted for PM and ozone, the heat wave effects are overestimated. In particular, when adjusting for PM10, estimates are reduced by about 30% and when adjusting for ozone they are reduced by about 15%–25% (more reduced for the younger, less for the elderly). The effects of heat waves on total natural mortality are larger during high ozone days, but this is less evident for those older than 85. Thus on low ozone days, the existence of a heat wave is associated with 10% increase in mortality, whilst on high ozone days it is associated with 13% increase. When fixed effects models are used the interaction is statistically significant for all ages and the age groups 0 to 64 and 75 to 84. Similarly, the effects of heat wave days on mortality are larger during high PM10 days (for those over 85 years a 13% increase in mortality associated with low PM10 days is observed, whilst a 19% is observed on high PM10 days), and the interaction term is significant for all ages, 74 to 85 and >85. Conclusion: Concluding, ozone and particles concentrations have an active role in the heat wave mortality relationship which must not been overlooked.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Air Pollution, Temperature

Air Pollution: Interaction with Temperature, Ozone, Particulate Matter, Other Air Pollution

Air Pollution (other): NO2; SO2; CO

Temperature: Extreme Heat, Fluctuations

Geographic Feature: ☑

resource focuses on specific type of geography

Urban

Geographic Location: ☑

resource focuses on specific location

Non-United States

Non-United States: Europe

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Morbidity/Mortality

Population of Concern: A focus of content

Population of Concern: ☑

populations at particular risk or vulnerability to climate change impacts

Elderly

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Time Scale Unspecified